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**Seabirds Incidental Catches and Shark Bycatches in the Pacific Ocean  
from Taiwanese Observer Data of 2002-2005**

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**Introduction**

Noting the increasing global attentions on the conservation of the ecosystem, the issue of incidental catches of ecological related species (ERS) in fishing operations has been of great concerns by States and conservation groups. The interaction between longline fishery and ERS such as seabirds has become a new focal point in this regard since recent decades. One of the major concerns relating to studies on the interaction is that information on ERS has usually been sparse or incomplete in the regular catch logbooks. Observer data is therefore important to be supplementary information to the study.

Longline fishery is one of the most important Taiwanese deep seas fisheries and operates all over the three oceans. To collect scientific data on major target species and ERS, the observer program has been launched since 2002 in the Pacific Ocean. There were altogether 13 vessels with one trip each vessel, have been observed in the Pacific Ocean during 2002-2005. This report presents summary information on the interactions with seabirds and sharks from these observing trips. This information, however, has to be used with caution when deriving status implication of the ERS due to low observer coverage.

**Data Collected by the Observer Program**

The data collected by observers include the following categories: (1) basic vessel's information such as size and equipments; (2) environmental information; (3) operation and effort information such as buoyline length, branch line length, number of baskets, setting time, number of hooks, number of hooks per basket, etc; (4) catch information such as catch in number, in weight and discards in number for all tuna and tuna-like species; (5) length measurements of major tuna and tuna-like species; and importantly (6) incidental catch information such as number of instance of incidental catch with life condition, etc.

The observer logbook format has been revised in 2004 and 2006 to require more information from the observing trip. Seabirds information was recorded at species category since the 2004 version of observer logbook was adopted. Identification cards and trainings were developed since then for observers to record interaction information with seabirds by species.

**Results and Discussions**

*Location and efforts*

The number of observers, vessels, fishing days and total efforts (numbers of hooks) of the observed trips in the Pacific Ocean during 2002-2005 was summarized

in Table 1. The observations were carried out on 13 longline vessels (including both albacore- and bigeye-targeting vessels) during these years. And each vessel had one observing trip in the period.

Roughly, each trip was about 2-4 months and each observer collected 3-7 months per year of fishing operations. Each observer conducted his observation in one or two vessels each year for the Pacific Ocean. Taking into account the voyage time to the designated observing vessel, the time for changing fishing ground and the time waiting for another observing vessel entering port or come close, each observer may have up to 8-9 months on duty for the Pacific missions between his leave and back to Taiwan.

The fishing efforts of observed vessels were mostly in the range of 2,800-3,600 hooks per day (lower in the tropical waters and higher in the temperate waters), with an average of 3,300 hooks per day.

Effort distribution of the observing vessels during 2002-05 is shown in Figure 1. Major efforts were distributed in the tropical region targeting bigeye tuna during the period, including two trips in the EPO in 2005. In addition, there was one trip in 2003 in the southwestern region, three trips altogether during 2004-05 in the north Pacific, targeting albacore tuna.

### *Catch composition*

Table 2 shows the annual catches and catch compositions (in terms of number) by major categories, and Figure 2 shows the catch compositions of tuna/billfishes and sharks by species. Tuna is the major catch category in the observed longline vessels in 2002-05 which composed more than 80% of the total catches. Among them, albacore and bigeye tunas composed most (Figure 2) because most of the observation was done in albacore/bigeye fishing grounds.

There was no incidental take of whales and dolphins during the 2002-05 observations. Only one sea turtle (Kemp's ridley, 60 cm in length) incidental catch was noted in the southeastern region of the EPO in 2005 by a bigeye vessel. Seabirds and sharks constitute most of the ERS in the bycatches from the observations. More information is provided in the following sections on these two animals.

### *Seabirds*

The overall incidental catch composition of seabird is in the range of 0.04-0.11% (Table 2). There was no catch recorded in the short period of 2002 observation. Based on observations of the following three year's (2003-05), seabirds were mainly incidentally caught in the waters of higher latitude (Figure 3), and therefore when more observations were in the temperate region the seabird catch composition was noted higher.

Table 3 listed the number of seabird interactions during the observation period of 2002-05. There were overall 30 interactions reported in 880 fishing days in the period. In general, the incidental catch rates were around 0.006-0.023 individuals per 1000 hooks in the entire Pacific during the period, while were in the range of 0.003-0.016 individuals per 1000 hooks in the EPO (east of 150°W). Higher catch rate was noted in 2003 in the waters northeastern of Zealand. Based on the available species information from 2004-05 observation, main species of seabirds caught was albatrosses and petrels which composed of more than 87% of the total. These

vessels have used some seabird deterrents such as setting at night and lineshooters.

Most seabirds were drowned (about 90%) when they were caught (Table 4). These birds were discarded at sea, with beaks cut for species identification purpose if necessary. Some seabirds were accidentally hooked when they were trying to take the un-used bait during line hauling. These birds were alive and were then released after removal of hooks (Figure 4). Photos and wing length of some of the birds were taken in later years' observations. Two metal bands on legs of albatrosses were noted during February to March of 2006, on an observation trip starting from late 2005 (Figure 4). One of them attached with an electronic tag. More collections of bands have been reported in 2006 observations of which information will be provided when the bands are delivered to Taiwan.

Visual surveys of seabirds were also conducted by observers. Number of seabirds were estimated and recorded in the logbooks. Figure 5 shows the distribution of seabirds spotted. Seabirds were more abundant in the high latitude regions. Species information of the spotted seabirds is however very insufficient because the observers are not seabird experts and could not recognize the species from distance and when the birds were in flying movement.

### *Sharks*

The catch composition of sharks is in the range of 2.73-5.20% during 2002-05 observations (Table 2). Blue shark composed most (about 60%) in the catches (Figure 2). Shortfin mako, silky shark and bigeye thresher together composed another 22%.

Table 3 shows the number of sharks caught by observed vessels and the catch rate. The catch rates are in the range of 0.44-0.89 fish/1000 hooks during 2002-05 for the entire Pacific Ocean. As to the EPO, the catch rates are in the range of 0.50-1.25 fish/1000 hooks. Catch distributions of sharks by observed vessels are shown in Figure 6.

The observers started the collection of shark-fin-ratio data since late of 2004 (Figure 7). Up to now, 308 fish data were compiled with 286 collected in 2004-05 and the rest 22 in 2006. All the samples were collected in the tropical waters (Figure 8). About 80% of the samples were from blue shark and 10% from silky shark. The data provides preliminary information that the shark-fin-ratio varies significantly by species and the way the shark carcasses are processed (especially for blue shark). There are more shark-fin-ratio data collected in 2006. After all the data were returned to Taiwan and compiled, analysis of these data will be reporting to the Commission.

Table 1. Number of observers, observed vessels, total efforts (1000 hooks) and fishing days of the observing trips in the Pacific Ocean during 2002-2005.

Year	No. Obs	No. Vessel	Total efforts	Fishing days
2002	1	1	186	65
2003	2	3	653	183
2004	2	4	1066	324
2005	4	5	982	308

Table 2. Catch in number and catch composition by main catch category in the observation trips to the Pacific Ocean during 2002-2005.

Year	Tunas		Billfishes		Sharks		Other fishes		Seabirds	
	No.	%	No.	%	No.	%	No.	%	No.	%
2002	2,374	83.36	147	5.16	81	2.84	246	8.64	0	0.00
2003	11,672	87.44	202	1.51	365	2.73	1,094	8.20	15	0.11
2004	12,253	88.11	519	3.73	733	5.20	518	3.72	6	0.04
2005	15,028	82.02	970	5.29	876	4.78	1,438	7.85	9	0.05

Table 3. Incidental catch in number and catch rate (numbers per 1000 hooks) of seabirds and by-catches of sharks recorded during the 2002-05 observations in the Pacific Ocean.

Year	Seabird				Shark			
	Overall		EPO		Overall		EPO	
	No.	Catch rate	No.	Catch rate	No.	Catch rate	No.	Catch rate
2002	0	0.000	0	0.000	81	0.436	42	0.507
2003	15	0.023	1	0.004	365	0.559	267	0.987
2004	6	0.006	1	0.003	733	0.688	391	1.250
2005	9	0.009	6	0.016	876	0.892	285	0.745

Table 4. Life status of the incidental catch of seabirds observed in the Pacific Ocean during 2002-2005.

Year	Total	Alive and released	Dead and discarded
2002	0	0	0
2003	15	1	14
2004	6	1	5
2005	9	1	8
Total	30	3 (10%)	23 (90%)

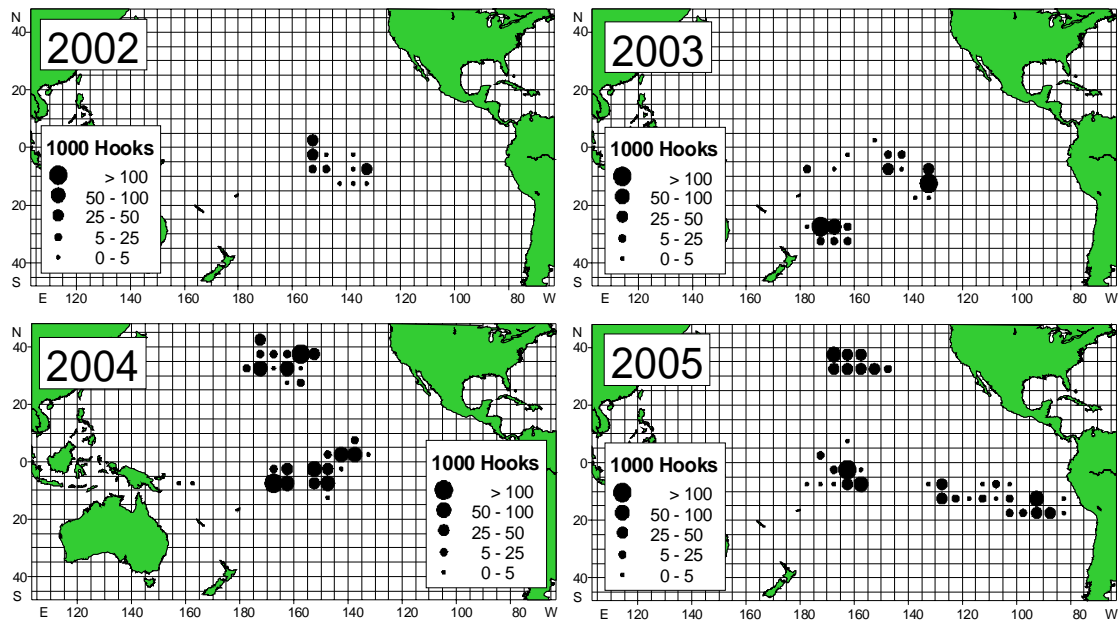


Figure 1. Effort distribution of the 13 observed vessels in the Pacific Ocean during 2002-05.

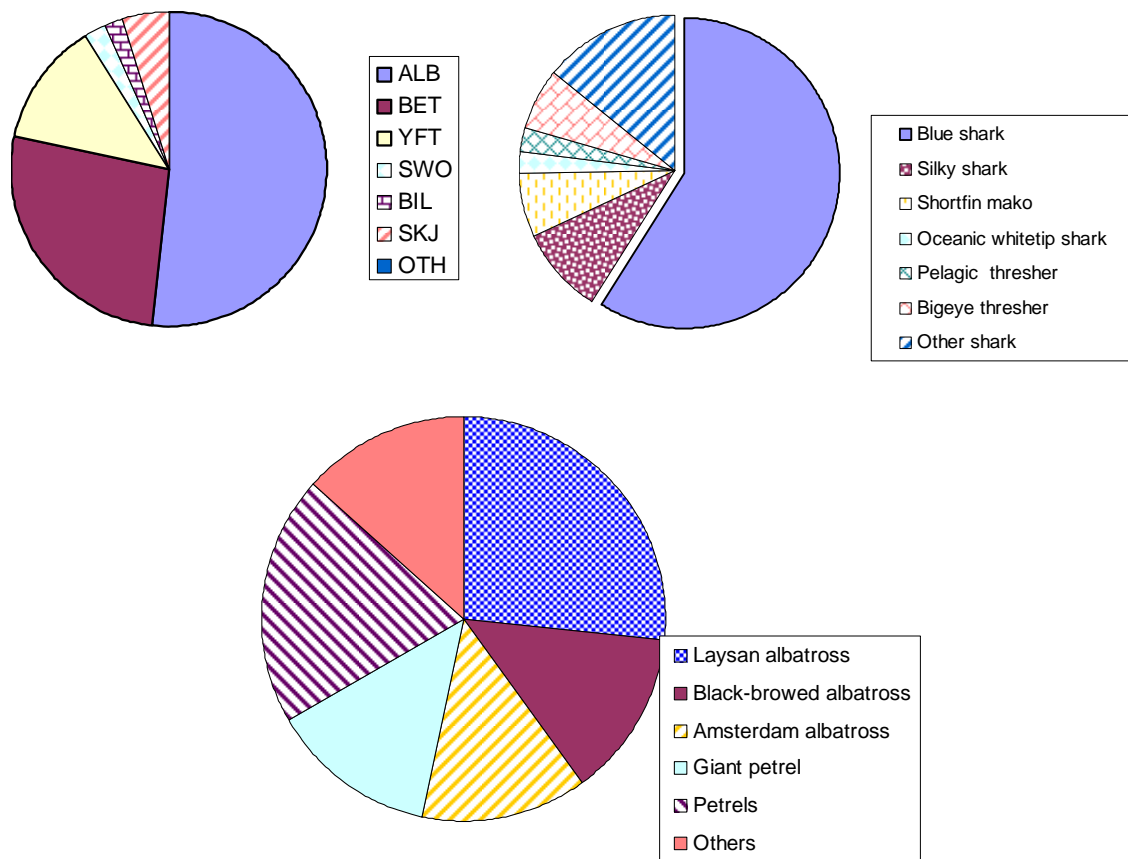


Figure 2. Catch compositions of tunas and billfishes (top left), sharks (top right) and seabirds (bottom) from the Pacific Ocean observation trips. Data of 2004-05 were used for seabirds and 2002-2005 for the rest.

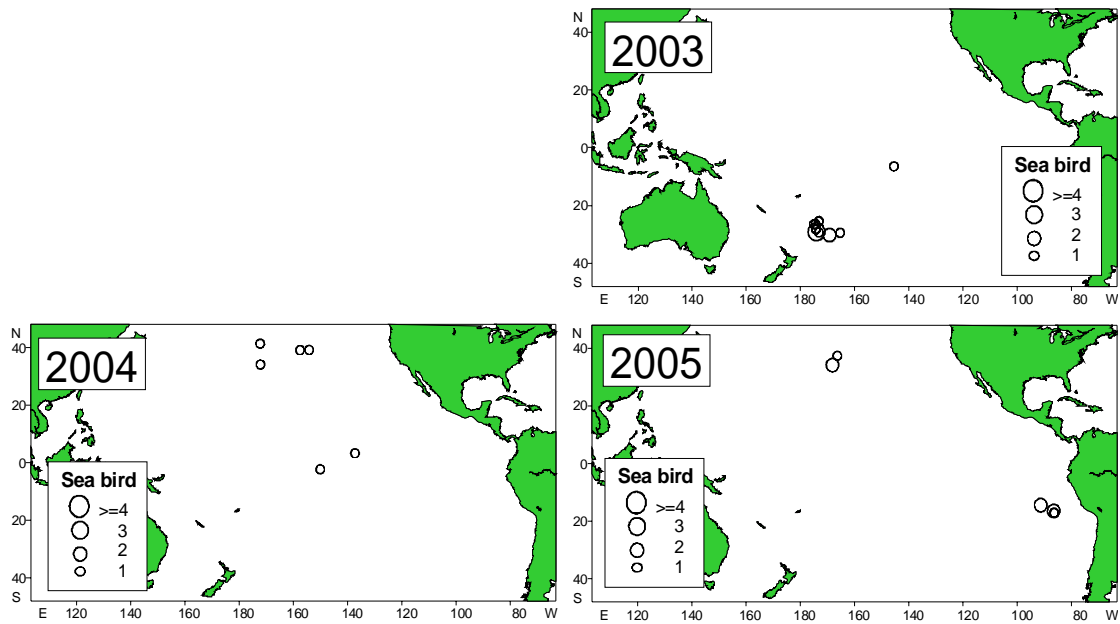


Figure 3. Distribution of incidental catches of seabirds in the 2003-05 observation trips. Each circle indicates one observing day with seabird interactions. The larger the circle is, the higher the number of interactions. (No seabird incidental catch was noted in 2002.)



Figure 4. Release of live seabird accidentally hooked during the longline operation in the North Pacific Ocean (left), and the two metal bands (right) collected from albatrosses in the same region during February to March of 2006 by an observer in an observation trip started from late 2005.

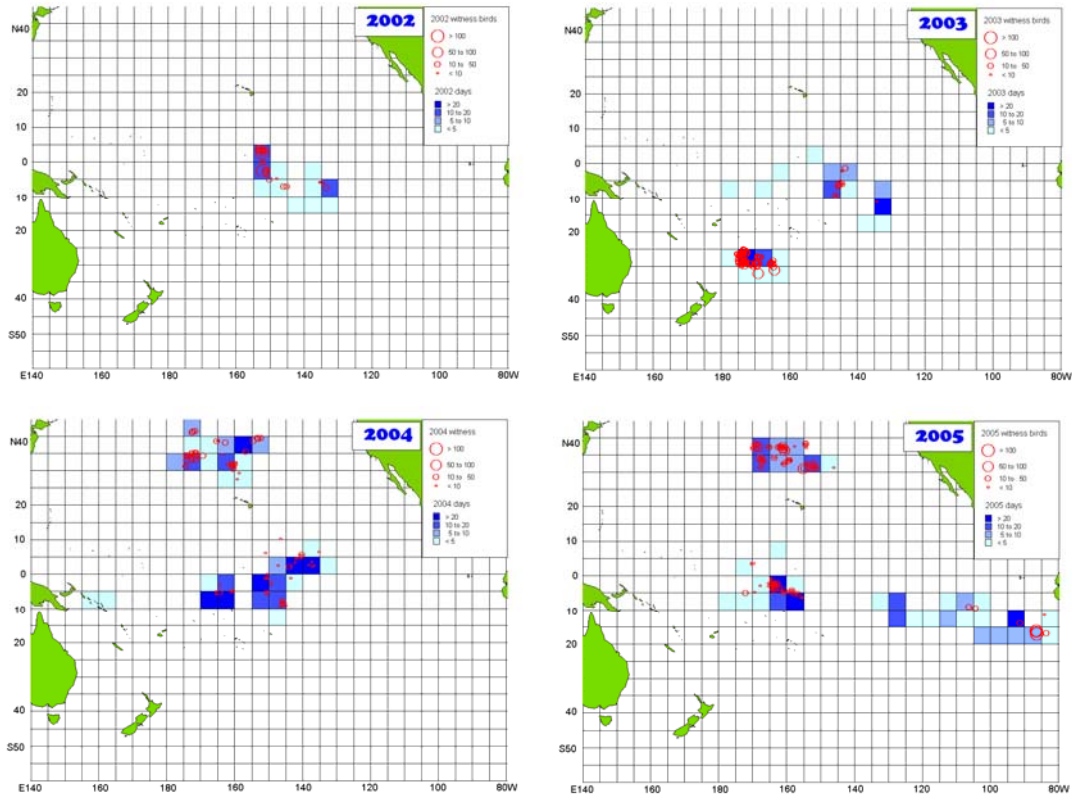


Figure 5. Number of seabirds spotted in the observation trips of 2002-05. The blue shade on the base indicates the number of observing days (effort), the darker the higher. The red circle indicates number of seabirds spotted in an observing day, the larger the higher. Effort position is the position when line setting started and will be a little different from the seabird spotting position in the operation.

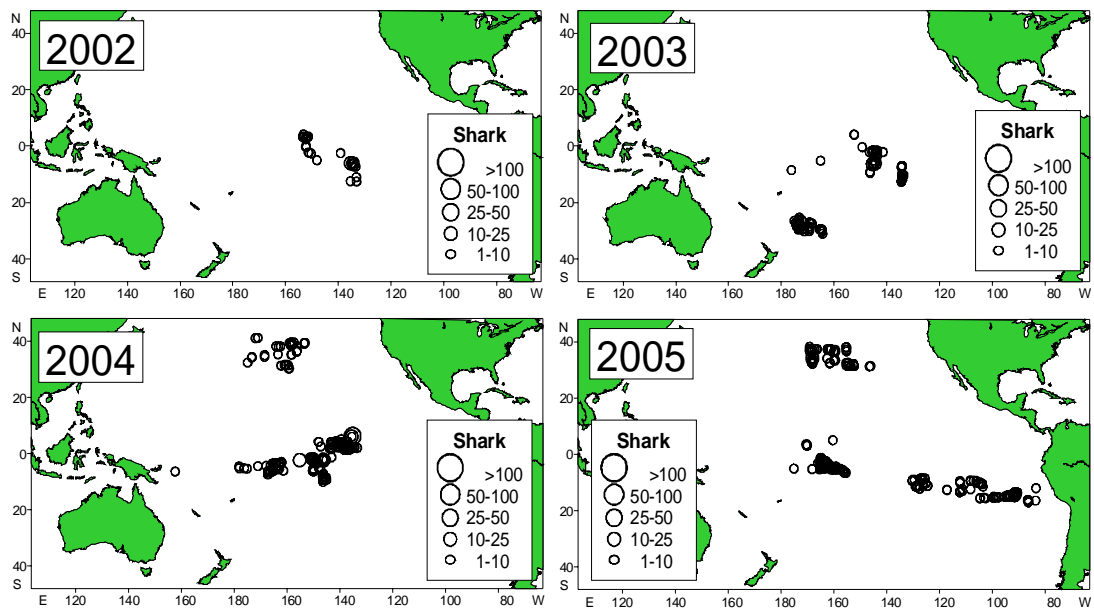


Figure 6. Distribution of shark bycatch in the 2002-05 observation trips. Each circle indicates one observing day with shark bycatch. The larger the circle is, the higher the number of sharks caught.



Figure 7. Collection of shark-fin-ratio data by observers on longline vessels.

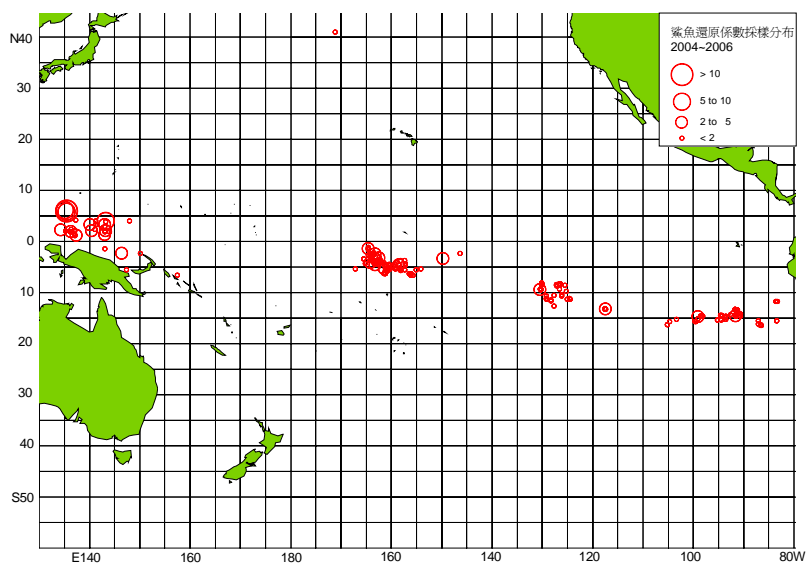


Figure 8. Location of the shark-fin-ratio data collected by observers in 2005 and 2006.